Menlo Park Notebook #76 [N-80-01-30]

This notebook has no dated entries but was probably used at the beginning of 1880. It contains notes, calculations, and tables relating to copper conductors. All of the entries are by Charles L. Clarke. The inside front cover is inscribed "C. L. Clarke." The book contains 284 numbered pages.

Blank pages not filmed: 26-284.

Missing page numbers: 1-4.

×E-172 N-80-01-30

C. L. Clarke.

Using the formula $I = \sqrt{\frac{(10.6421272595)l}{R}}$,

We have when:-

$R = \frac{1}{2}$ ohm,

$I^2 = 21.28425-45-19\,l$,

$I = 4.613486\sqrt{l}$,

$R = 1$ ohm,

$I^2 = 10.6421272595\,l$,

$I = 3.26223\sqrt{l}$,

$R = 1\frac{1}{2}$ ohms,

$I^2 = 7.09478484\,l$,

$I = 2.6636\sqrt{l}$,

$R = 2$ ohms,

$I^2 = 5.321063629 75\,l$,

$I = 2.306743\sqrt{l}$,

$R = 2\frac{1}{2}$ ohms,

$I^2 = 4.25685090 38\,l$,

$I = 2.06321 37\sqrt{l}$,

$R = 3$ ohms,

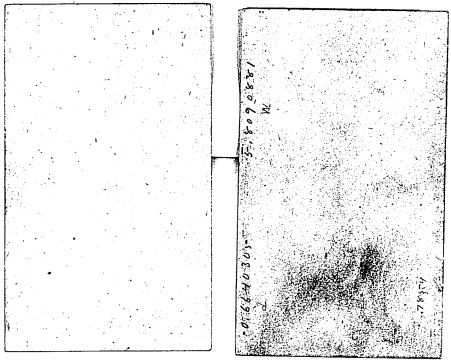
$I^2 = 3.547375753 17\,l$,

$I = 1.883345\sqrt{l}$,

[ITEM FOUND IN BOOK]

dynamit 2 =	0,15051108 log.	
" 3 =	0,23855730 log.	
" 4 =	0.30103300 log.	
" 5 =	0.34949912 log.	
" 6 =	0,38790774 log.	
" 8 =	0,45154408 log.	
" 10 =	0.50000031 log.	
" 12 =	0,53959904 log.	
" 14 =	0,57306990 log.	
" 16 =	0.60206000 log.	
" 18 =	0,62763211 log.	
" 20 =	0.65051115 log.	

[ITEM FOUND IN BOOK]



$R = 4$ ohms,

$I^2 = 2.660531814871\,l$,

$I = 1.631115\sqrt{l}$.

$R = 5$ ohms,

$I^2 = 2.128425454519\,l$,

$I = 1.45891\sqrt{l}$.

$R = 6$ ohms,

$I^2 = 1.773685876661\,l$,

$I = 1.33179\sqrt{l}$.

$R = 7$ ohms,

$I^2 = 1.520303895561\,l$,

$I = 1.23298\sqrt{l}$.

$R = 8$ ohms.

$I^2 = 1.330265907471\,l$,

$I = 1.15348\sqrt{l}$,

$R = 9$ ohms,

$I^2 = 1.182458558441\,l$,

$I = 1.08741\sqrt{l}$,

$R = 10$ ohms,

$I^2 = 1.064212725951\,l$;

$I = 1.0316\sqrt{l}$.

Page 4 we have the weight of any length of copper wire, with a conductivity 97,

$W = .000003027\,I^2 l$, in lbs.

Substituting the values of I^2 which have just been given we have:-

When $R = \frac{1}{2}$ ohm,

$W = .000064427441\,l^2$,

$R = 1$ ohm,

$W = .000032213721\,l^2$,

$R = 1\frac{1}{2}$ ohms,

$W = .000021475811\,l^2$,

$R = 2$ ohms,

$W = .000016106861\,l^2$,

$R = 2\frac{1}{2}$ ohms,

$W = .000012885551\,l^2$,

$R = 3$ ohms,

$W = .000010738\,l^2$,

$R = 4$ ohms,

$W = .000008053431\,l^2$,

$R = 5$ ohms,

$W = .0000064427 4 l^2$,

$R = 6$ ohms,

$W = .0000005369 l^2$,

$R = 7$ ohms,

$W = .0000004602 l^2$,

$R = 8$ ohms.

$W = .0000040267 l^2$,

$R = 9$ ohms

$W = .0000035793 l^2$,

$R = 10$ ohms,

$W = .0000032213 72 l^2$,

In order to facilitate the calculation of the tables the value of I will be taken to four decimal places, and the value of W will be taken to the first four digits.

We then have for the values of I and W by which the tables are made:—

		Logarithms of constants.
$R = \frac{1}{2}$ ohm	$I = 4.6135\sqrt{l}$,	0. 66403
	$W = .0000643 3 l^2$,	$\bar{5}$. 80909
$R = 1$ ohm	$I = 3.2622\sqrt{l}$,	0. 51351
	$W = .0000322 1 l^2$,	$\bar{5}$. 50799
$R = 1\frac{1}{2}$ ohms	$I = 2.6636\sqrt{l}$,	0. 42547
	$W = .0000214 8 l^2$.	$\bar{5}$. 33203
$R = 2$ ohms	$I = 2.3067\sqrt{l}$,	0. 36299
	$W = .0000161 1 l^2$.	$\bar{5}$. 20710
$R = 2\frac{1}{2}$ ohms	$I = 2.0632\sqrt{l}$.	0. 31454
	$W = .0000128 9 l^2$.	$\bar{5}$. 11125

		Logarithms of Constants
$R = 3$ ohms	$Z = 1.8835\sqrt{l}$.	0.27497
	$W = .000010794\,l^2$,	$\bar{5}.03100$
$R = 4$ ohms	$Z = 1.6311\sqrt{l}$,	0.21248
	$W = .000008053\,l^2$,	$\bar{6}.90596$
$R = 5$ ohms	$Z = 1.4589\sqrt{l}$,	0.16403
	$W = .000006443\,l^2$,	$\bar{6}.80909$
$R = 6$ ohms	$Z = 1.3318\sqrt{l}$,	0.12444
	$W = .000005369\,l^2$,	$\bar{6}.72989$
$R = 7$ ohms	$Z = 1.2330\sqrt{l}$,	0.09096
	$W = .000004602\,l^2$,	$\bar{6}.66295$
$R = 8$ ohms	$Z = 1.1535\sqrt{l}$.	0.06202
	$W = .000004027\,l^2$,	$\bar{6}.60498$
$R = 9$ ohms	$Z = 1.0874\sqrt{l}$.	0.03639
	$W = .000003579\,l^2$.	$\bar{6}.55976$
$R = 10$ ohms	$Z = 1.0316\sqrt{l}$.	0.01351
	$W = .000003221\,l^2$,	$\bar{6}.50799$

1/2 Ohm Resistance.

Distance	Length of Conductor	Diam. in.	Area sq. in.	Weight per foot lbs.	Total Weight lbs.	Cost.
20 ft.	40 ft.	.029			.103	
40	80	.041			.413	
60	120	.051			.928	
80	160	.058			1.650	
100	200	.065			2.577	
120	240	.072			3.711	
140	280	.077			5.051	
160	320	.083			6.598	
180	360	.088			8.350	
200	400	.092			10.309	
222	440	.097			12.473	
240	480	.101			14.845	
260	520	.105			17.421	
280	560	.109			20.205	
300	600	.113			23.195	
320	640	.117			26.392	
340	680	.120			29.793	
360	720	.125			33.400	
380	760	.127			37.215	
400	800	.130			41.236	
420	840	.134			45.452	
440	880	.137			49.892	
460	920	.140			54.534	
480	960	.143			59.380	
500	1000	.146			64.431	

1 Ohm Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.021			1.052	
.029			.206	
.036			.464	
.041			.825	
.046			1.289	
.051			1.855	
.055			2.525	
.058			3.298	
.062			4.174	
.065			5.154	
.068			6.236	
.072			7.421	
.074			8.710	
.077			10.101	
.080			11.596	
.082			13.192	
.085			14.894	
.087			16.696	
.090			18.605	
.092			20.616	
.095			22.722	
.096			24.944	
.099			27.262	
.102			29.684	
.103			32.210	

1½ Ohms Resistance

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.017			.034	
.024			.138	
.029			.309	
.034			.550	
.038			.859	
.041			1.237	
.045			1.684	
.048			2.200	
.051			2.784	
.053			3.437	
.056			4.159	
.058			4.949	
.061			5.808	
.063			6.736	
.065			7.733	
.068			8.800	
.070			9.932	
.072			11.136	
.073			12.398	
.075			13.748	
.077			15.153	
.079			16.636	
.081			18.181	
.082			19.796	
.084			21.480	

2 Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.015			.026	
.021			.103	
.025			.232	
.029			.412	
.033			.644	
.036			.928	
.039			1.263	
.041			1.650	
.044			2.088	
.046			2.578	
.048			3.119	
.051			3.712	
.053			4.356	
.055			5.052	
.057			5.800	
.058			6.600	
.060			7.449	
.062			8.352	
.064			9.305	
.065			10.312	
.067			11.365	
.068			12.476	
.070			13.636	
.072			14.848	
.073			16.111	

2½ Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.013			.021	
.019			.083	
.023			.186	
.026			.330	
.029			.516	
.032			.743	
.035			1.011	
.037			1.320	
.039			1.671	
.041			2.062	
.043			2.496	
.045			2.970	
.047			3.484	
.049			4.042	
.051			4.640	
.052			5.280	
.054			5.960	
.055			6.684	
.057			7.445	
.058			8.248	
.060			9.093	
.061			9.984	
.063			10.910	
.064			11.880	
.065			12.890	

3 Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.012			.017	
.017			.069	
.021			.155	
.024			.275	
.027			.430	
.029			.619	
.032			.842	
.034			1.101	
.036			1.392	
.038			1.718	
.040			2.079	
.041			2.475	
.043			2.904	
.045			3.368	
.046			3.866	
.048			4.404	
.049			4.966	
.051			5.568	
.052			6.204	
.054			6.872	
.055			7.576	
.057			8.316	
.058			9.090	
.060			9.900	
.061			10.740	

4 Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.010			.013	
.015			.052	
.018			.116	
.021			.206	
.023			.323	
.025			.464	
.027			.631	
.029			.825	
.031			1.044	
.033			1.289	
.034			1.559	
.036			1.855	
.037			2.178	
.039			2.525	
.040			2.899	
.041			3.300	
.043			3.724	
.044			4.176	
.045			4.652	
.047			5.156	
.047			5.681	
.048			6.236	
.050			6.816	
.051			7.420	
.052			8.053	

5 Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.009			.010	
.013			.041	
.016			.093	
.019			.165	
.021			.258	
.023			.371	
.024			.505	
.026			.660	
.028			.835	
.029			1.039	
.031			1.247	
.032			1.485	
.033			1.742	
.035			2.021	
.036			2.320	
.037			2.640	
.038			2.979	
.040			3.340	
.040			3.722	
.041			4.156	
.042			4.545	
.044			4.988	
.044			5.453	
.045			5.940	
.046			6.443	

6 Ohms Resistance.

Diam.	Area.	Weight per foot	Total Weight.	Cost
.008			.009	
.012			.034	
.015			.077	
.017			.138	
.019			.215	
.021			.309	
.022			.421	
.024			.550	
.025			.696	
.027			.859	
.028			1.039	
.029			1.237	
.030			1.452	
.032			1.684	
.033			1.933	
.034			2.200	
.035			2.483	
.035			2.784	
.037			3.101	
.038			3.436	
.039			3.788	
.040			4.156	
.040			4.537	
.041			4.948	
.042			5.369	

7 Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.008			.007	
.011			.029	
.014			.066	
.016			.118	
.017			.184	
.019			.265	
.021			.361	
.022			.471	
.023			.596	
.025			.736	
.026			.891	
.027			1.060	
.028			1.244	
.030			1.443	
.030			1.657	
.031			1.884	
.032			2.128	
.033			2.384	
.034			2.658	
.035			2.944	
.036			3.247	
.037			3.564	
.037			3.895	
.038			4.240	
.039			4.602	

8 Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.007			.006	
.010			.026	
.013			.058	
.015			.103	
.016			.161	
.018			.232	
.019			.316	
.021			.412	
.022			.522	
.023			.644	
.024			.780	
.025			.928	
.026			1.089	
.027			1.263	
.028			1.450	
.030			1.648	
.030			1.862	
.031			2.088	
.032			2.326	
.032			2.576	
.033			2.841	
.034			3.120	
.035			3.408	
.035			3.712	
.037			4.027	

9 Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.007			.006	
.010			.023	
.012			.052	
.014			.093	
.015			.145	
.017			.209	
.018			.285	
.020			.372	
.021			.470	
.022			.581	
.023			.703	
.024			.836	
.025			.981	
.026			1.138	
.027			1.306	
.028			1.488	
.029			1.678	
.030			1.880	
.030			2.096	
.031			2.324	
.032			2.560	
.033			2.812	
.033			3.071	
.034			3.344	
.034			3.629	

10 Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.0065			.005	
.009			.021	
.011			.046	
.013			.083	
.015			.129	
.016			.186	
.017			.253	
.019			.330	
.020			.417	
.021			.515	
.022			.624	
.023			.742	
.024			.871	
.024			1.010	
.025			1.160	
.027			1.320	
.027			1.490	
.028			1.668	
.029			1.861	
.030			2.060	
.030			2.272	
.031			2.496	
.031			2.726	
.033			2.968	
.033			3.221	